

THE CLAIMS

WHAT IS CLAIMED IS:

1. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient at rest on a support surface, wherein is provided a predetermined patient turn interval, comprising:
 - 5 (a) a patient location sensor for determining at least approximately a location of the patient on the support surface;
 - (b) a time circuit;
 - (c) a microprocessor in electronic communication with said patient location sensor and said time circuit, said microprocessor at least for
 - 10 (c1) determining from said time circuit and said patient location sensor a time since the patient last significantly changed location, and,
 - (c2) initiating a signal indicative of a state of the patient depending on at least said patient location and said time since the patient last significantly changed location; and,
 - 15 (d) an alarm in electronic communication with said microprocessor and responsive thereto, said alarm at least for responding to said signal indicative of a state of the patient to produce an alarm signal.
2. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient
20 according to Claim 1, wherein said patient location sensor is a bed mat.
3. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 1, wherein said patient location sensor is a chair mat.

4. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 1, wherein said patient location sensor is selected from a group consisting of a plurality of accelerometers, an infrared sensor, a video camera, an ultrasonic sensor, a plurality of strain gages, and, a plurality of inclinometers.

5. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 1, wherein said alarm is selected from a group consisting of a speaker, a light, a buzzer, a pager, a piezoelectric device, and a beeper.

6. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 1,

wherein said apparatus is for use with a bed, said bed having at least four legs,
and

wherein said location sensor includes at least one weight sensor positioned proximate to at least one of said bed legs.

7. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 7, wherein said bed has four legs and wherein said location sensor includes at least four weight sensors, one weight sensor being positioned under each of said four bed legs.

8. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 1, wherein said support surface comprises

a mattress, and,

an approximately rectangular mattress support surface supporting said mattress,

5 wherein said location sensor includes a plurality of weight sensors, each of said plurality of weight sensors being placed proximate to a corner of said mattress support surface, thereby sensing at least the weight of the patient and the mattress together.

9. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 1, wherein

10 said patient location sensor is a mat containing a plurality of sensor points thereon,

each of said plurality of sensor points being separately readable by said microprocessor,

15 said sensor points being for use in determining at least approximately a location of the patient.

10. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 9, wherein said sensor points are temperature sensors.

20 11. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 9, wherein said sensor points are piezoelectric elements.

12. An electronic patient monitor according to Claim 1, wherein said microprocessor is chosen from a group consisting of a microcontroller, a PLD, a CPLD, an EPLD, a SPLD, a PAL, an FPLA, an FPLS, a GAL, a PLA, an FPAA, a PSoC, a SoC, a CSoC, and an ASIC.

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13. A method for reducing the risk of occurrence of decubitus ulcers in a patient, comprising the steps of:

- (a) selecting a patient turn interval;
- (b) selecting a persistence time period;
- 10 (c) determining a first position of the patient;
- (d) determining a start time contemporaneously with the determination of step (c);
- (e) determining a current position of the patient;
- (f) comparing said first position and said current position to determine if the patient has changed position;
- 15 (g) if the patient has not changed position,
 - (g1) determining an elapsed time since said start time,
 - (g2) comparing said elapsed time with said selected turn interval, and,
 - (g3) activating an alarm if said elapsed time exceeds said selected turn interval;
- (h) if the patient has changed position,
- 20 (h1) continuing to monitor the patient for a period of time at least equal to the persistence time period,

(h2) if the patient returns at least approximately to said first position before the end of the persistence time period, continuing to monitor the patient until at least the end of said selected turn interval.

(h3) if the patient does not return to said first position before the end of the persistence period,

(i) determining a new first position,

(ii) determining a new start time contemporaneously with said determination of said new first position, and,

(iii) continuing to monitor the patient according to steps (e) through (h) using said new start time in place of said start time and said new first position in place of said first position.

14. A method for reducing the risk of occurrence of decubitus ulcers in a patient at rest on a support surface, comprising the steps of:

(a) selecting a patient turn interval;

(b) selecting a persistence time period, said persistence time period being less than said patient turn interval and greater than zero;

(c) determining an initial position of the patient on the support surface;

(d) continuously monitoring a patient's position on a support surface for a period of time at least as long as said patient turn interval;

(e) if, during the monitoring period, the patient did not move from said initial position, activating an alarm at the end of the patient turn interval;

(f) if, during the monitoring period, the patient moved from said initial position to a new position, but said new position was not maintained for a period of time at least as long as said persistence time, activating an alarm at the end of the patient turn interval;

5 (g) if, during the monitoring period, the patient moved from said initial position to said new position, and said new position was maintained for a period of time at least as long as said persistence time, continuing to monitor the patient until at least the end of the patient turn interval; and,

(h) performing at least steps (c) through (g) as necessary to reduce the risk of
10 occurrence of decubitus ulcers in the patient.

15. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient at rest on a support surface, wherein is provided a predetermined patient turn interval, comprising:

(a) a patient location sensor for determining at least approximately a location of the
15 patient on the support surface;

(b) a time circuit;

(c) a monitor circuit in electronic communication with said patient location sensor and said time circuit, said monitor circuit at least for

(c1) determining from said time circuit and said patient location sensor a time
20 since the patient last significantly changed location, and,

(c2) initiating a signal indicative of a state of the patient depending on at least said patient location and said time since the patient last significantly changed location; and,

(e) an alarm in electronic communication with said monitor circuit and responsive thereto, said alarm at least for responding to said signal indicative of a state of the patient to produce an alarm signal.

5 16. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient at rest on a support surface according to claim 15, wherein said monitor circuit comprises a microprocessor.

10 17. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient at rest on a support surface according to claim 15, wherein said monitor circuit comprises a plurality of resetable analog timers.

15 18. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 15, wherein said patient location sensor is selected from a group consisting of a bed mat, a chair mat, a plurality of accelerometers, an infrared sensor, a video camera, an ultrasonic sensor, a plurality of strain gages, and, a plurality of inclinometers.

20 19. An apparatus for reducing the risk of occurrence of decubitus ulcers in a patient according to Claim 15, wherein said alarm is selected from a group consisting of a speaker, a light, a buzzer, a pager, a piezoelectric device, and a beeper.

20. An electronic patient monitor according to Claim 16, wherein said microprocessor is chosen from a group consisting of a microcontroller, a PLD, a CPLD, an EPLD, a SPLD, a PAL, an FPLA, an FPLS, a GAL, a PLA, an FPAA, a PSoC, a SoC, a CSoC, and an ASIC.